

Appendix G4
Air Quality - General Conformity Analysis

**GENERAL CONFORMITY ANALYSIS
CABRILLO PORT LIQUEFIED NATURAL GAS DEEPWATER PORT
PROJECT**

September 2006

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EXECUTIVE SUMMARY

On September 3, 2003, BHP Billiton LNG International Inc. (BHPB) submitted a Deepwater Port Act application to the U.S. Coast Guard (USCG) and U.S. Maritime Administration (MARAD) and an application for a lease of State lands to the California State Lands Commission to own, construct, and operate the Cabrillo Port Liquefied Natural Gas (LNG) Deepwater Port (hereafter referred to as the “Project”).

In March 2006, the USCG and MARAD announced the availability of and solicited public input on a Draft General Conformity Determination (DGCD) for the Project. The DGCD concluded that emissions of oxides of nitrogen (NO_x) from Project construction activities in Los Angeles County were above de minimis thresholds and thus subject to the General Conformity Rule. All other Project-related emissions were determined not to be subject to the General Conformity Rule in both Ventura and Los Angeles Counties.

Subsequent to the issuance of the DGCD, BHPB provided a commitment to the USCG that all onshore pipeline construction equipment would, to the extent possible, utilize engines compliant with United States Environmental Protection Agency (USEPA) Tier 2, 3, or 4 non-road engine standards with Tier 2 being the minimum standard for any engine. Appendix A presents a letter from BHPB to the USCG outlining this commitment, which would be verified through an engine certification monitoring program to be outlined in the Construction Emissions Reduction Plan required for the Project.

The USCG reanalyzed Project emissions to assess the potential emission reductions associated with the stated commitment and to reassess the applicability of the General Conformity Rule. The revised General Conformity analysis revealed that all applicable Project emissions would be less than de minimis thresholds in both Ventura and Los Angeles Counties and, therefore, not subject to the General Conformity Rule. Based on this conclusion, the USCG and MARAD will not finalize the DGCD nor solicit public comment on this revised General Conformity analysis.

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1. INTRODUCTION

This analysis has been prepared to assess if actions by the U.S. Coast Guard (USCG) and the U.S. Maritime Administration (MARAD) regarding the proposed Cabrillo Port Liquefied Natural Gas (LNG) Deepwater Port Project (the Project) would be subject to the requirements of the Federal Clean Air Act General Conformity Rule. This analysis has been prepared in conjunction with a comprehensive assessment of the environmental consequences of the proposed Project that is required under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

In March 2006, the USCG and MARAD announced the availability of and solicited public input on a Draft General Conformity Determination (DGCD) for the Project. The DGCD concluded that emissions of oxides of nitrogen (NO_x) from Project construction activities in Los Angeles County were above de minimis thresholds and thus are subject to the General Conformity Rule. All other Project-related emissions were determined not to be subject to the General Conformity Rule in both Ventura and Los Angeles Counties.

Subsequent to the issuance of the DGCD, BHPB provided a commitment to the USCG that all onshore pipeline construction equipment would, to the extent possible, utilize engines compliant with United States Environmental Protection Agency (USEPA) Tier 2, 3, or 4 non-road engine standards with Tier 2 being the minimum standard for any engine. Attachment A presents a letter from BHPB to the USCG outlining this commitment. Following consultation with the USEPA, the USCG decided to reanalyze Project emissions to assess the potential emission reductions associated with the stated commitment and to reassess the applicability of the General Conformity Rule.

2. PROJECT DESCRIPTION

On September 3, 2003, BHP Billiton LNG International Inc. (BHPB) submitted a Deepwater Port Act application to the USCG and MARAD and an application for a lease of State lands to the California State Lands Commission to own, construct, and operate the Cabrillo Port LNG Deepwater Port. The proposed facilities include a new offshore LNG floating storage and regasification unit (FSRU) located approximately 12 nautical miles (14 miles or 22 kilometers) off the coast of Ventura and Los Angeles Counties, California; new offshore and onshore natural gas pipelines; and related facilities. Project details include those listed below.

- Double-hulled, cryogenic vessels would transport LNG from the Pacific Basin (Australia's Scarborough Field is BHPB's preferred source) and unload the LNG at the FSRU, where it would be stored and then regasified. The FSRU would receive approximately two to three shipments per week (up to 130 LNG carriers per year).
- The FSRU would be a new, ship-shaped, double-sided, double-bottom facility with three spherical tanks. The FSRU would have a displacement of approximately 190,000 dead weight tons and a total LNG storage capacity of about 72 million gallons (273,000 cubic meters). The FSRU would be moored to

the sea floor by a fixed, turret-style mooring point that uses nine cables and anchor points; it would not contain engines and could not steam under its own power.

- LNG would be regasified on the FSRU using a controlled heating process consisting of a closed system with combustion vaporizers submerged in fresh water; seawater would not be used to regasify the LNG.
- BHPB would install, own, operate, and maintain two new 24-inch diameter natural gas pipelines between the FSRU and a new onshore metering station and would deliver an average of 800 million cubic feet per day of natural gas (not LNG) to shore for distribution by the Southern California Gas Company (SoCalGas). BHPB would also fund the construction of the following facilities: the metering station; a new 36-inch diameter pipeline from the metering station to Center Road Station in Ventura County; a new 30-inch diameter pipeline loop in Santa Clarita, Los Angeles County; and other onshore Project-related facilities. SoCalGas would own, operate, and maintain these onshore components.

Project construction would begin in 2009. Operation of the FSRU would begin in 2010. The USCG and MARAD are the lead Federal agencies for the review of the Project.

3. REGULATORY BACKGROUND – GENERAL CONFORMITY

Section 176(c) of the Federal Clean Air Act states that Federal agencies cannot engage, support, or provide financial assistance for licensing, permitting, or approving any project unless the project conforms to the applicable State Implementation Plan (SIP). A SIP is a compilation of a state's air quality control plans and rules, approved by the USEPA. The USEPA's goals are to eliminate or reduce the severity and number of violations of National Ambient Air Quality Standards (NAAQS) and achieve expeditious attainment of these standards.

Pursuant to Clean Air Act Section 176(c) requirements, the USEPA promulgated Title 40 of the Code of Federal Regulations Part 51 (40 CFR § 51) Subpart W and 40 CFR § 93 Subpart B, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans." These regulations, commonly referred to as the General Conformity Rule, apply to all Federal actions except for those Federal actions related to transportation plans, programs, and projects under Title 23 U.S. Code or the Federal Transit Act, which are subject to Transportation Conformity.

The General Conformity Rule defines a Federal action as any activity engaged in by a department, agency, or instrumentality of the Federal government or any activity that a department, agency, or instrumentality of the Federal government supports in any way, provides financial assistance for, licenses, permits, or approves. The General Conformity Rule applies only to Federal actions in locations designated as nonattainment or maintenance areas for any criteria air pollutant under 40 CFR § 81, "Designation of Areas for Air Quality Planning Purposes."

The General Conformity Rule is used to determine if Federal actions meet the requirements of the Clean Air Act and the applicable SIP by ensuring that air emissions related to the action do not:

- Cause or contribute to new violations of a NAAQS;
- Increase the frequency or severity of any existing violation of a NAAQS; or
- Delay timely attainment of a NAAQS or interim emission reduction.

A Federal action is subject to the General Conformity Rule if it is not classified as an exempt activity, as listed in 40 CFR § 93 Subpart B and if the total direct and indirect emissions of a pollutant (or its precursors), for which the area is classified as nonattainment or a maintenance area, equal or exceed (1) emission thresholds established in the General Conformity regulations or (2) 10 percent of the total emissions budget for the entire nonattainment or maintenance area. If emissions are less than these criteria levels, then the Federal action is presumed to conform with the SIP.

In Ventura County, Ventura County Air Pollution Control District Rule 220, "General Conformity" incorporates Federal General Conformity regulations by reference. In the portions of Los Angeles County with the South Coast Air Basin, South Coast Air Quality Management District (SCAQMD) Rule 1901, "General Conformity," incorporates Federal General Conformity regulations by reference.

4. APPLICABILITY

The FSRU would be located in Federal waters in the vicinity of mainland Ventura County, as well as Anacapa and San Nicolas Islands, which are both part of Ventura County. Other Project operations and/or construction activities would occur in Federal waters, Ventura County waters, and in onshore Ventura County, and portions of Los Angeles County within the South Coast Air Basin.

For the purposes of the Project, Federal waters are defined as the Pacific Ocean outside of the boundaries of any county of California, i.e., beyond 3 nautical miles (3.5 miles or 5.6 kilometers) of the mean high tide line of any mainland or island coastline.

Under 40 CFR § 81, the Channel Islands, which are part of Ventura County (and, thus, in the South Central Coast Air Basin), have separate air quality designations from the other parts of the County. Table 1 presents a summary of the air quality designations of Ventura County, the Channel Islands, and the portion of Los Angeles County within the South Coast Air Basin.

Since the location of the proposed facility falls between mainland Ventura County and the Channel Islands, the USEPA had discretion in determining which regulatory requirements would be more appropriately applied to the FSRU. The USEPA determined that it would regulate and permit the FSRU in the same manner as emission sources in the Federal attainment area, i.e., in the same manner as sources on the Channel Islands. Federal actions in the Channel Islands are not subject to General Conformity because the region is not classified as a Federal nonattainment or maintenance area; therefore, the

USEPA concluded that the proposed issuance of a permit under the Deepwater Port Act—and any other Federal action directly associated with FSRU operation—would not be subject to the General Conformity Rule. Thus, any emissions related to FSRU installation and operations (including support vessel operation) in attainment, maintenance, or nonattainment areas would not be subject to General Conformity.

Table 1 Federal Air Quality Area Designations

Pollutant	Ventura County	Channel Islands^a	Los Angeles County^b
CO	A	A	Serious NA
Lead	A	A	A
NO ₂	A	A	A/M
Ozone	Moderate NA	A	Severe NA
PM ₁₀	A	A	Serious NA
PM _{2.5}	A	A	NA
SO ₂	A	U	A

Source: 40 CFR § 81.305.

Key:

A = attainment

A/M = attainment designated as maintenance area due to prior nonattainment designation

NA = nonattainment

U = unclassified

CO = carbon monoxide

NO₂ = nitrogen dioxide

PM₁₀ = particulate matter with aerodynamic diameters less than or equal to 10 microns

PM_{2.5} = particulate matter with aerodynamic diameters less than or equal to 2.5 microns

SO₂ = sulfur dioxide

Notes:

^aRefers to Channel Islands in the South Central Coast Air Basin (including Ventura County).

^bIncludes only the portion of Los Angeles County within the South Coast Air Basin.

The USEPA has further concluded that portions of the Pacific Ocean that are beyond the federally recognized limit of California (i.e., in Federal waters) have not been designated with respect to NAAQS. Since Federal waters have not been designated under 40 CFR § 81, any emissions generated from Project-related operations and construction that occur in Federal waters are not subject to the General Conformity Rule.

Project-related construction activities, such as the installation of offshore and onshore pipelines, would also require Federal actions (e.g., licenses, permits, and/or approvals from Federal agencies) that could be applicable to the General Conformity Rule. Since Ventura County and Los Angeles County (within the South Coast Air Basin) are considered as nonattainment or maintenance areas for at least one criteria pollutant, direct and indirect emissions associated with Federal actions taken for Project construction in Ventura and Los Angeles Counties were analyzed to determine applicability to the General Conformity Rule.

Ventura County is a Federal non-attainment area only for ozone, so emissions of ozone precursors, oxides of nitrogen (NO_x) and reactive organic compounds (also known as volatile organic compounds [VOC]) were analyzed for Ventura County.

Los Angeles County is a Federal non-attainment area for ozone, carbon monoxide (CO), particulate matter with aerodynamic diameters less than or equal to 10 microns (PM₁₀), and particulate matter with aerodynamic diameters less than or equal to 10 microns (PM_{2.5}). Los Angeles County is also a nitrogen dioxide (NO₂) maintenance area. The following emissions were analyzed for Los Angeles County:

- NO_x (as a surrogate for NO₂ and ozone precursor)
- VOC (as an ozone precursor);
- CO;
- PM₁₀;
- PM_{2.5}; and
- sulfur dioxide (SO₂) (as a precursor for PM_{2.5}).

Emissions of VOC and ammonia were not analyzed as precursors of PM_{2.5} in this analysis because these pollutants have not been designated as significant precursors of PM_{2.5} in the SIP.

Project-related construction that would occur in Ventura County and/or Los Angeles County includes offshore pipeline installation, shore crossing construction, and onshore pipeline installation. The activities associated with onshore pipeline installation are further separated into trenching, pipelaying, boring, and drilling. Table 2 compares Project-related construction emissions in Ventura County with General Conformity Rule thresholds and 10 percent regional emission levels. Table 3 compares Project-related construction emissions in Los Angeles County with General Conformity Rule thresholds and 10 percent regional emission levels. Attachment B provides a summary of Project construction emission calculations.

Table 2 Comparison of Emissions in Ventura County to General Conformity Thresholds

Air Pollutant	Project Construction Emissions (tons per year)	Applicability Levels	
		General Conformity Thresholds ^a (tons per year)	10% of Regional Emissions Budget ^b (tons per year)
NO _x	70.3	100	1,420
VOC	14.1	100	1,560

Notes:

^a 40 CFR § 93.153 (based on final rule amendments effective July 17, 2006).

^b Calculated by multiplying emission forecast (in tons per day) for Year 2005 Alternative 3 (Ventura County Draft 1995 Air Quality Management Plan Revision, Table 6-2) by 365 days per year and 10 percent.

Table 3 Comparison of Emissions in Los Angeles County to General Conformity Thresholds

Emission Type	Air Pollutant	Project Construction Emissions (tons per year)	Applicability Levels	
			General Conformity Thresholds ^a (tons per year)	10% of Regional Emissions Budget ^b (tons per year)
Direct Emissions	NO _x (NO ₂)	20.0	100	19,400
	CO	41.8	100	80,000
	PM ₁₀	5.6	70	11,200
	PM _{2.5}	2.2	100	3,900
Ozone Precursor Emissions	NO _x	20.0	25	19,400
	VOC	4.8	25	15,100
PM _{2.5} Precursor Emissions	SO ₂	0.1	100	2,600
	NO _x	20.0	100	19,400

Notes:

^a 40 CFR § 93.153 (based on final rule amendments effective July 17, 2006).

^b NO_x, CO, PM₁₀, and VOC emissions based on 2010 emission inventory in SCAQMD 1997/1999 Air Quality Management Plan. PM_{2.5} emissions based on 2010 emission inventory in SCAQMD 2003 Air Quality Management Plan. SO₂ emissions based on average annual day emissions in 2010 in the South Coast Air Basin (SCAQMD 1997 Air Quality Management Plan, Table A-13).

5. CONCLUSION

According to these comparisons, all Project-related emissions are less than de minimis thresholds and thus not subject to the General Conformity Rule. A General Conformity determination is not required.

6. COMMENTS

Due to the commitment from the BHPB to use the Tier 2, 3 or 4 equipment for all onshore construction, which has been verified by the Coast Guard and MARAD to reduce applicable project related emissions to a level that is below the regulatory threshold for General Conformity Determinations, the USCG and MARAD will not finalize the previously issued DGCD nor solicit public comment on this revised General Conformity analysis. However, through the upcoming Public Hearing for the Project required under the mandates of the Deepwater Port Act where written and oral comments from the public are solicited, the public will have an opportunity to comment on this General Conformity Analysis, the Final EIR/EIS that incorporates this analysis, and on our determination that General Conformity no longer applies to these Project emissions. The date and location of the Public Hearing, which will be held shortly after the release of the Final EIR/EIS, will be announced by newspaper notice, mailing of the notice to interested parties, and publication of a notice in the Federal Register.

Attachment A
August 31, 2006 Letter from BHPB to the USCG

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August 31, 2006

Mr. Mark Prescott
Chief, Deepwater Ports Standards Division
United States Coast Guard
2100 Second Street, S.W.
Washington, DC 20593-0001

RE: Draft General Conformity Determination – Cabrillo Port LNG Deepwater Port Project, Docket No. USCG-2004-16877

Dear Mr. Prescott:

This letter is submitted as an addendum to our letter of comment dated April 13, 2006, and in replacement of our letter dated July 18, 2006, regarding your Draft General Conformity Determination for the Cabrillo Port Liquefied Natural Gas Deepwater Port Project dated March 2006.

In that letter we stated that we had identified a flaw in our initial construction emission calculations, which overstated air emissions by approximately 15 percent. We cited the URBEMIS2002 Appendix H emission factors for construction equipment based on turnover rate and determined that the construction emissions calculation in the draft general Conformity Determination did not utilize the engine/equipment turnover methodology dictated by URBEMIS2002, Appendix H. Based on the turnover rate predicted by the URBEMIS2002 model, a material portion of the construction equipment in the year when we construct the onshore pipeline component of the Cabrillo Port Project will utilize engines with emissions less than or equal to the Tier 2 non-road emission limits. If the percentage of construction equipment predicted by the URBEMIS2002 model is converted to Tier 2 equipment, NO_x emissions from onshore pipeline construction will be below the significance thresholds in both Los Angeles County and Ventura County.

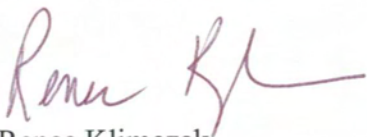
By this letter, BHP Billiton commits to go even further to reduce onshore construction emissions. BHP Billiton agrees to commit that all of its onshore pipeline construction equipment will, to the extent possible, utilize engines compliant with the relevant USEPA Tier 2, 3 or 4 non-road engine standards with Tier 2 being the minimum standard for equipment being used by BHP Billiton. Utilizing the URBEMIS2002 engine conversion methodology confirms that the onshore pipeline construction emissions will be less than

Mr. Mark Prescott
United States Coast Guard
August 31, 2006
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the significance thresholds. However, the URBEMIS2002 methodology assumes that only a portion of some construction equipment engine types is converted; turnover rates dictated by the model range from 3 years (i.e., all equipment converted by 2003) to 16 years (i.e., all equipment converted by 2016) depending upon equipment type. By BHP Billiton making the additional commitment that all of the onshore pipeline construction equipment will, to the extent possible, utilize engines compliant with the USEPA Tier 2, 3 or 4 non-road engines standards with Tier 2 being the minimum standard for equipment being used by BHP Billiton, BHP Billiton will cause emissions to be even lower than those predicted by the URBEMIS2002 methodology. This commitment also removes any uncertainty as to whether the URBEMIS2002 methodology correctly estimated equipment turnover rates.

Please contact me if you have any questions.

Sincerely,



Renee Klimczak
President

RK:cr

cc: Mr. Dwight Sanders, California State Lands Commission

Attachment B
Emission Calculations

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Table 1
Summary of Construction Emissions (Direct and Indirect Emissions)
Cabrillo Port LNG Deepwater Port

EMISSIONS BY ACTIVITY

Construction Activity	Total Emissions (tons)					
	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Mooring/FSRU Installation	27.4	0.019	33.8	1.6	1.6	4.0
Offshore Pipeline Installation	97.0	0.068	119.5	5.6	5.6	14.1
Shore Crossing Construction	30.5	0.027	23.5	2.5	2.1	5.5
Onshore Pipeline Installation - Trenching	17.4	0.025	16.1	1.9	1.2	3.8
Onshore Pipeline Installation - Pipelay	13.7	0.10	75.3	11.6	3.5	4.5
Onshore Pipeline Installation - Boring	3.9	0.0040	2.2	0.79	0.32	0.79
Onshore Pipeline Installation - Drilling	9.2	0.009	5.2	1.0	0.5	1.9
Worker Commuting	0.95	0.12	14.0	0.25	0.25	0.4
TOTAL	200	0.37	290	25	15	35

EMISSIONS BY LOCATION

Construction Activity	Total Emissions (tons)					
	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
<u>Federal Waters</u>						
Mooring/FSRU Installation	27.4	0.02	33.8	1.6	1.6	4.0
Offshore Pipeline Installation	82.4	0.06	101.5	4.8	4.8	11.9
Subtotal	109.8	0.08	135.3	6.4	6.4	15.9
<u>Ventura County</u>						
Offshore Pipeline Installation	14.5	0.010	17.9	0.8	0.8	2.1
Shore Crossing Construction	30.5	0.027	23.5	2.5	2.1	5.5
Onshore Pipeline Installation - Trenching	11.6	0.017	10.7	1.3	0.8	2.6
Onshore Pipeline Installation - Pipelay	9.2	0.066	50.2	7.8	2.3	3.0
Onshore Pipeline Installation - Boring	3.9	0.004	2.2	0.8	0.3	0.8
Worker Commuting	0.54	0.067	7.9	0.14	0.14	0.25
Subtotal	70.3	0.19	112.5	13.3	6.5	14.1
<u>Los Angeles County</u>						
Onshore Pipeline Installation - Trenching	5.8	0.0084	5.4	0.64	0.41	1.3
Onshore Pipeline Installation - Pipelay	4.6	0.033	25.1	3.9	1.2	1.5
Onshore Pipeline Installation - Drilling	9.2	0.0092	5.2	1.0	0.51	1.9
Worker Commuting	0.41	0.0514	6.1	0.11	0.11	0.19
Subtotal	20.0	0.10	41.8	5.6	2.2	4.8
TOTAL	200	0.37	290	25	15	35

Table 2
Emissions from Mooring/FSRU Installation
Cabrillo Port LNG Deepwater Port

Equipment Type	No. of Devices	Engine Rating per Device (bhp)	Fuel Type	Daily Operation per Device (hrs/day)	Average Load	Total Working Days ^d	Engine Output (bhp-hr/day)	Daily Emissions (lb/day)						Total Emissions (tons)					
								NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
AHTS ^a	2	15,000	diesel	24	10%	20	72,000	1,095	0.8	1,349	63	63	159	11.0	0.0077	13.5	0.63	0.63	1.59
Crew Boat	1	1,500	diesel	16	23%	20	5,520	84	0.1	103	5	5	12	0.8	0.0006	1.0	0.05	0.05	0.12
Construction Barge ^b	1	8,000	diesel	24	43%	20	82,560	1,256	0.9	1,547	73	73	182	12.6	0.0088	15.5	0.73	0.73	1.82
Tug ^c	1	6,500	diesel	24	9%	20	14,040	214	0.1	263	12	12	31	2.1	0.0015	2.6	0.12	0.12	0.31
Ocean Going Tug	1	25,000	diesel	24	20%	1	120,000	1,825	1.3	2,249	106	106	265	0.9	0.0006	1.1	0.05	0.05	0.13
TOTAL								4,474	3	5,512	259	259	648	27.4	0.019	33.8	1.6	1.6	4.0

Notes:

a. AHTS also handles risers

b. Barge used to transport anchors and equipment

c. Tug boat used as riser installation vessel.

d. Total vessel-days equivalent to task estimates, multiple vessels used in some tasks, composite daily estimate is conservative for planned activities due to vessel overlap

Table 3
Emissions from Offshore Pipeline Installation
Cabrillo Port LNG Deepwater Port

Equipment Type ^a	No. of Devices	Engine Rating per Device (bhp)	Daily Operation per Device (hrs/day)	Mileage per Day (mile/day)	Avg Load	Total Working Days	Engine Output (bhp-hr/day)	Daily Emissions (lb/day)						Total Emissions (tons)					
								NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Pipe Laying Vessel	1	25,000	24	-	47%	35	282,000	4,290	3	5,285	249	249	622	75.1	0.0526	92.5	4.35	4.35	10.88
AHTS ^b	2	15,000	24	-	10%	35	72,000	1,095	1	1,349	63	63	159	19.2	0.0134	23.6	1.11	1.11	2.78
Crew Boat	1	1,500	16	-	23%	35	5,520	84	0	103	5	5	12	1.5	0.0010	1.8	0.09	0.09	0.21
Tug Boat & Barge ^c	1	4,000	16	-	26%	10	16,640	253	0	312	15	15	37	1.3	0.0009	1.6	0.07	0.07	0.18
Dock Crane (35 ton)	1	130	1	-	80%	8	104	1	0.001	1	0.14	0.14	0.2	0.005	0.000004	0.004	0.0006	0.0006	0.001
Delivery Truck	1	-	-	60	-	5	-	2	0.006	0.1	0.02	0.02	0.03	0.005	0.00002	0.0003	0.00004	0.00004	0.0001
TOTAL								5,725	4	7,050	332	332	830	97.0	0.068	119.5	5.6	5.6	14.1

Notes:

- a. All equipment is diesel-fueled.
- b. AHTS also provides welding power when needed.
- c. Barge used to transport pipe and material off-shore (not powered) and tug boat pulls pipe barge.

Table 4
Emissions from Shore Crossing Construction
Cabrillo Port LNG Deepwater Port

EQUIPMENT EXHAUST EMISSIONS

Equipment Type	No. of Devices	Engine Rating per Device (bhp)	Fuel Type	Daily Operation per Device (hrs/day)	Daily Mileage per Device (mi/day)	Average Load	Total Working Days	Engine Output (bhp-hr/day)	Daily Emissions (lb/day)						Total Emissions (tons)					
									NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
In-hole head drive unit	1	400	diesel	6	-	100%	88	2,400	25	0.03	14	0.8	0.8	5	1.1	0.0011	0.6	0.03	0.03	0.23
Mud pumps	2	400	diesel	9	-	100%	88	7,200	76	0.08	41	2	2	16	3.4	0.0034	1.8	0.10	0.10	0.70
Solids control unit	1	500	diesel	9	-	100%	88	4,500	48	0.05	26	1.5	1.5	10	2.1	0.0021	1.1	0.07	0.07	0.44
Thrusting apparatus	1	300	diesel	6	-	100%	88	1,800	19	0.02	10	0.6	0.6	4	0.8	0.0008	0.5	0.03	0.03	0.17
Electrical generator	1	400	diesel	24	-	80%	85	7,680	81	0.08	44	3	3	17	3.5	0.0035	1.9	0.11	0.11	0.72
All Terrain Forklift	1	100	diesel	12	-	30%	60	360	4	0.004	3	0.2	0.2	1	0.1	0.0001	0.1	0.01	0.01	0.02
Mobile crane	1	400	diesel	7.2	-	80%	85	2,304	24	0.02	13	0.8	0.8	5	1.0	0.0010	0.6	0.03	0.03	0.22
Welding machines	3	100	diesel	12	-	80%	85	2,880	30	0.03	17	1	1	6	1.3	0.0013	0.7	0.04	0.04	0.27
Exit Hole Barge Tug	1	4,000	diesel	24	-	5%	35	4,800	73	0.05	90	4	4	11	1.3	0.0009	1.6	0.07	0.07	0.19
AHTS	1	15,000	diesel	24	-	10%	35	36,000	548	0.38	675	32	32	79	9.6	0.0067	11.8	0.56	0.56	1.39
Contingency	1	700	diesel	24	-	100%	60	16,800	207	0.18	96	6	22	37	6.2	0.0054	2.9	0.17	0.67	1.11
18 Wheeler Truck	2	-	diesel	-	60	-	60	-	4	0.01	0.21	0.03	0.03	0.06	0.1	0.0004	0.01	0.001	0.001	0.002
Subtotal									1,140	0.9	1,029	51	68	191	30.5	0.027	23.5	1.2	1.7	5.5

FUGITIVE DUST EMISSIONS FROM PAVED AND UNPAVED ROADS IN CONSTRUCTION ZONE

Equipment Type	No. of Devices	Daily Mileage per Device (mi/day)	Daily Mileage per Device on Paved Roads (mi/day)	Daily Mileage per Device on Unpaved Roads (mi/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
						NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
All Terrain Forklift	1	1.6	0	1.6	60	-	-	-	0.58	0.09	-	-	-	-	0.017	0.003	-
18 Wheeler Truck	2	1.2	0.6	0.6	60	-	-	-	0.82	0.16	-	-	-	-	0.02	0.00	-
Subtotal						-	-	-	1.4	0.3	-	-	-	-	0.04	0.01	-

FUGITIVE DUST EMISSIONS FROM PAVED ROADS OUTSIDE CONSTRUCTION ZONE

Equipment Type	No. of Devices	Daily Mileage per Device (mi/day)	Daily Mileage per Device on Paved Roads (mi/day)	Daily Mileage per Device on Unpaved Roads (mi/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
						NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
18 Wheeler Truck	2	58.8	58.8	0	60	-	-	-	37.4	9.3	-	-	-	-	1.12	0.28	-
Subtotal						-	-	-	37.4	9.3	-	-	-	-	1.12	0.28	-

FUGITIVE DUST EMISSIONS FROM EARTHMOVING

Equipment Type	No. of Devices	Daily Operation per Device (hrs/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
				NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Track Backhoe	1	12	60	-	-	-	4.3	2.4	-	-	-	-	0.13	0.07	-
Subtotal				-	-	-	4.3	2.4	-	-	-	-	0.13	0.07	-

TOTAL EMISSIONS

	Daily Emissions (lb/day)						Total Emissions (tons)					
	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
	1,140	0.9	1,029	94	80	191	30.5	0.027	23.5	2.5	2.1	5.5

Table 5
Emissions from Onshore Pipeline Installation - Trenching
Cabrillo Port LNG Deepwater Port

EQUIPMENT EXHAUST EMISSIONS

Equipment Type	No. of Devices	Engine Rating per Device (bhp)	Fuel Type	Daily Operation per Device (hrs/day)	Daily Mileage per Device (mi/day)	Average Load	Total Working Days	Engine Output (bhp-hr/day)	Daily Emissions (lb/day)						Total Emissions (tons)					
									NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Trenching Machine	1	1,000	diesel	12	-	80%	180	9,600	102	0.10	55	3	3	21	9.1	0.0092	5.0	0.29	0.29	1.90
Track Backhoe	1	500	diesel	12	-	80%	180	4,800	51	0.05	28	2	2	11	4.6	0.0046	2.5	0.14	0.14	0.95
Front Loader	1	200	diesel	12	-	50%	180	1,200	13	0.01	7	0.4	0.4	3	1.2	0.0012	0.6	0.04	0.04	0.24
Bulldozer	1	200	diesel	12	-	50%	180	1,200	13	0.01	7	0.4	0.4	3	1.2	0.0012	0.6	0.04	0.04	0.24
Dragline	1	200	diesel	12	-	50%	180	1,200	13	0.01	7	0.4	0.4	3	1.2	0.0012	0.6	0.04	0.04	0.24
Concrete Saw	1	50	gasoline	12	-	50%	180	300	2	0.09	76	0.1	0.1	3	0.2	0.0078	6.8	0.01	0.01	0.26
Subtotal									193	0.3	179	6	6	43	17.4	0.025	16.1	0.5	0.5	3.8

FUGITIVE DUST EMISSIONS FROM UNPAVED ROADS

Equipment Type	No. of Devices	Daily Mileage per Device (mi/day)	Daily Mileage per Device on Paved Roads (mi/day)	Daily Mileage per Device on Unpaved Roads (mi/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
						NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Front Loader	1	6.1	0	6.1	180	-	-	-	1.9	0.3	-	-	-	-	0.173	0.026	-
Subtotal						-	-	-	1.9	0.3	-	-	-	-	0.17	0.03	-

FUGITIVE DUST EMISSIONS FROM EARTHMOVING

Equipment Type	No. of Devices	Daily Operation per Device (hrs/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
				NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Track Backhoe	1	12	180	-	-	-	4.3	2.4	-	-	-	-	0.39	0.22	-
Bulldozer	1	12	180	-	-	-	4.3	2.4	-	-	-	-	0.39	0.22	-
Dragline	1	12	180	-	-	-	4.3	2.4	-	-	-	-	0.39	0.22	-
Subtotal				-	-	-	13.0	7.2	-	-	-	-	1.17	0.65	-

FUGITIVE DUST EMISSIONS FROM TERTIARY CRUSHING AND MATERIAL CONVEYING

Equipment Type	Pipe Diameter (ft)	Excavated Area (ft ² /ft)	Advance Rate (ft/hr)	Excavated Volume (ft ³ /hr)	Soil Density (lb/ft ³)	Excavated Soil Weight (ton/hr)	Daily Operation per Device (hrs/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
									NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Trenching Machine ^a	3	20.93	53.78	1126	100	56.3	12	180	-	-	-	0.43	0.09	-	-	-	-	0.04	0.01	-

Notes:

a. Trenching includes two conveyor points.

TOTAL EMISSIONS

									Daily Emissions (lb/day)						Total Emissions (tons)					
									NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
									193	0.28	179	21	14	43	17.4	0.025	16.1	1.9	1.2	3.8

Table 6
Emissions from Onshore Pipeline Installation - Pipelay
Cabrillo Port LNG Deepwater Port
 (Page 1 of 2)

EQUIPMENT EXHAUST EMISSIONS

Equipment Type	No. of Devices	Engine Rating per Device (bhp)	Fuel Type	Daily Operation per Device (hrs/day)	Daily Mileage per Device	Average Load	Total Working Days	Engine Output (bhp-hr/day)	Daily Emissions (lb/day)						Total Emissions (tons)					
									NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Heavy Fork Lift	1	200	diesel	12	-	50%	180	1,200	13	0.01	7	0.4	0.4	3	1.2	0.0012	0.6	0.04	0.04	0.24
Sideboom Tractor	2	200	diesel	12	-	50%	180	2,400	26	0.03	14	0.8	0.8	5	2.3	0.0023	1.2	0.07	0.07	0.48
Mobile Crane	1	200	diesel	12	-	50%	180	1,200	13	0.01	7	0.4	0.4	3	1.2	0.0012	0.6	0.04	0.04	0.24
Pipe Bending Machine	1	100	diesel	12	-	50%	90	600	6	0.01	5	0.3	0.3	1	0.3	0.0003	0.2	0.01	0.01	0.06
Hydrostatic Test Pump	1	200	diesel	12	-	50%	30	1,200	13	0.01	7	0.4	0.4	3	0.2	0.0002	0.1	0.01	0.01	0.04
Fill Dirt Screener	1	200	diesel	12	-	50%	180	1,200	13	0.01	7	0.4	0.4	3	1.2	0.0012	0.6	0.04	0.04	0.24
Sheepsfoot Compactor	1	200	diesel	12	-	50%	180	1,200	13	0.01	7	0.4	0.4	3	1.2	0.0012	0.6	0.04	0.04	0.24
Cement Pump	1	100	diesel	12	-	50%	90	600	6	0.01	5	0.3	0.3	1	0.3	0.0003	0.2	0.01	0.01	0.06
Asphalt Paving Machine	1	200	diesel	12	-	50%	90	1,200	13	0.01	7	0.4	0.4	3	0.6	0.0006	0.3	0.02	0.02	0.12
Asphalt Roller	1	100	diesel	12	-	50%	90	600	6	0.01	5	0.3	0.3	1	0.3	0.0003	0.2	0.01	0.01	0.06
Welding Generator	2	50	gasoline	12	-	50%	180	600	4	0.2	151	0.2	0.2	6	0.4	0.0156	13.6	0.02	0.02	0.52
Utility Generator	2	50	gasoline	12	-	50%	180	600	4	0.2	151	0.2	0.2	6	0.4	0.0156	13.6	0.02	0.02	0.52
Air Compressor	2	50	gasoline	12	-	50%	180	600	4	0.2	151	0.2	0.2	6	0.4	0.0156	13.6	0.02	0.02	0.52
Dewatering Pump	2	50	gasoline	12	-	50%	30	600	4	0.2	151	0.2	0.2	6	0.1	0.0026	2.3	0.00	0.00	0.09
Vibratory Roller	2	50	gasoline	12	-	50%	180	600	4	0.2	151	0.2	0.2	6	0.4	0.0156	13.6	0.02	0.02	0.52
Hydraulic Tamper	2	50	gasoline	12	-	50%	180	600	4	0.2	151	0.2	0.2	6	0.4	0.0156	13.6	0.02	0.02	0.52
Dump Truck	2	-	diesel	-	60	-	180	-	4	0.01	0.21	0.03	0.03	0.06	0.4	0.0012	0.02	0.003	0.003	0.005
Water Truck	2	-	diesel	-	60	-	180	-	4	0.01	0.21	0.03	0.03	0.06	0.4	0.0012	0.02	0.003	0.003	0.005
Utility Truck	2	-	diesel	-	60	-	180	-	4	0.01	0.21	0.03	0.03	0.06	0.4	0.0012	0.02	0.003	0.003	0.005
Lowboy Truck	4	-	diesel	-	120	-	180	-	16	0.05	0.83	0.13	0.13	0.24	1.4	0.0046	0.07	0.011	0.011	0.022
Pipe Stringing Truck	2	-	diesel	-	60	-	180	-	4	0.01	0.21	0.03	0.03	0.06	0.4	0.0012	0.02	0.003	0.003	0.005
Cement Truck	2	-	diesel	-	60	-	90	-	4	0.01	0.21	0.03	0.03	0.06	0.2	0.0006	0.01	0.001	0.001	0.003
Asphalt Truck	2	-	diesel	-	60	-	90	-	4	0.01	0.21	0.03	0.03	0.06	0.2	0.0006	0.01	0.001	0.001	0.003
Subtotal									187	1.3	979	5	5	60	13.7	0.10	75.3	0.4	0.4	4.5

FUGITIVE DUST EMISSIONS FROM PAVED AND UNPAVED ROADS IN CONSTRUCTION ZONE

Equipment Type	No. of Devices	Daily Mileage per Device (mi/day)	Daily Mileage per Device on Paved Roads (mi/day)	Daily Mileage per Device on Unpaved Roads (mi/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
						NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Mobile Crane	1	0.1	0	0.1	180	-	-	-	0.03	0.005	-	-	-	-	0.0028	0.0004	-
Heavy Forklift	1	3.1	0	3.1	180	-	-	-	0.97	0.15	-	-	-	-	0.088	0.013	-
Dump Truck	2	1.2	0.6	0.6	180	-	-	-	0.50	0.09	-	-	-	-	0.04	0.01	-
Water Truck	2	1.2	0.6	0.6	180				0.50	0.09					0.04	0.01	
Utility Truck	2	1.2	0.6	0.6	180				0.50	0.09					0.04	0.01	
Lowboy Truck	4	2.4	1.2	1.2	180				1.99	0.35					0.18	0.03	
Pipe Stringing Truck	2	1.2	0.6	0.6	180				0.50	0.09					0.04	0.01	
Cement Truck	2	1.2	0.6	0.6	90				0.50	0.09					0.02	0.00	
Asphalt Truck	2	1.2	0.6	0.6	90				0.50	0.09					0.02	0.00	
Subtotal						-	-	-	6.0	1.0	-	-	-	-	0.49	0.08	-

Table 6
Emissions from Onshore Pipeline Installation - Pipelay
Cabrillo Port LNG Deepwater Port
(Page 2 of 2)

FUGITIVE DUST EMISSIONS FROM PAVED ROADS OUTSIDE CONSTRUCTION ZONE

Equipment Type	No. of Devices	Daily Mileage per Device (mi/day)	Daily Mileage per Device on Paved Roads (mi/day)	Daily Mileage per Device on Unpaved Roads (mi/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
						NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Dump Truck	2	58.8	58.8	0	180	-	-	-	11.8	2.9	-	-	-	-	1.06	0.26	-
Water Truck	2	58.8	58.8	0	180	-	-	-	11.8	2.9	-	-	-	-	1.06	0.26	-
Utility Truck	2	58.8	58.8	0	180	-	-	-	11.8	2.9	-	-	-	-	1.06	0.26	-
Lowboy Truck	4	117.6	117.6	0	180	-	-	-	47.1	11.7	-	-	-	-	4.24	1.05	-
Pipe Stringing Truck	2	58.8	58.8	0	180	-	-	-	11.8	2.9	-	-	-	-	1.06	0.26	-
Cement Truck	2	58.8	58.8	0	90	-	-	-	11.8	2.9	-	-	-	-	0.53	0.13	-
Asphalt Truck	2	58.8	58.8	0	90	-	-	-	11.8	2.9	-	-	-	-	0.53	0.13	-
Subtotal						-	-	-	117.8	29.2	-	-	-	-	9.54	2.36	-

FUGITIVE DUST EMISSIONS FROM EARTHMOVING

Equipment Type	No. of Devices	Daily Operation per Device (hrs/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
				NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Sideboom Tractor	2	12	180	-	-	-	8.6	4.8	-	-	-	-	0.78	0.43	-
Sheepsfoot Compactor	1	12	180	-	-	-	4.3	2.4	-	-	-	-	0.39	0.22	-
Subtotal				-	-	-	13.0	7.2	-	-	-	-	1.17	0.65	-

FUGITIVE DUST EMISSIONS FROM TERTIARY CRUSHING AND MATERIAL CONVEYING

Equipment Type	Pipe Dia. (ft)	Excavated Area (ft ² /ft)	Advance Rate (ft/hr)	Excavated Volume (ft ³ /hr)	Soil Density (lb/ft ³)	Excavated Soil Weight (ton/hr)	Daily Operation per Device (hrs/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
									NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Fill Dirt Screener	3	20.93	53.78	1126	100	56.3	12	180	-	-	-	0.50	0.03	-	-	-	-	0.04	0.003	-

TOTAL EMISSIONS

									Daily Emissions (lb/day)						Total Emissions (tons)					
									NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
									187	1.3	979	143	43	60	13.7	0.10	75.3	11.6	3.5	4.5

Table 7
Emissions from Onshore Pipeline Installation - Boring
Cabrillo Port LNG Deepwater Port

EQUIPMENT EXHAUST EMISSIONS

Equipment Type	No. of Devices	Engine Rating per Device (bhp)	Fuel Type	Daily Operation per Device (hrs/day)	Daily Mileage per Device (mi/day)	Average Load	Total Working Days	Engine Output (bhp-hr/day)	Daily Emissions (lb/day)						Total Emissions (tons)					
									NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Horizontal Boring Rig	1	1,000	diesel	24	-	80%	30	19,200	203	0.20	110	6	6	42	3.0	0.0031	1.7	0.10	0.10	0.63
Track Backhoe	1	200	diesel	12	-	50%	30	1,200	13	0.01	7	0.4	0.4	3	0.2	0.0002	0.1	0.01	0.01	0.04
All Terrain Forklift	1	100	diesel	12	-	50%	30	600	6	0.01	5	0.3	0.3	1	0.1	0.0001	0.1	0.00	0.00	0.02
Light Towers	6	20	diesel	12	-	100%	30	1,440	18	0.02	16	2	2	3	0.3	0.0002	0.2	0.03	0.03	0.05
Heavy Lift Crane	1	500	diesel	6	-	50%	30	1,500	16	0.02	9	0.5	0.5	3	0.2	0.0002	0.1	0.01	0.01	0.05
18 Wheeler Truck	2	-	diesel	-	60	-	30	-	4	0.01	0.21	0.03	0.03	0.06	0.1	0.0002	0.00	0.000	0.000	0.001
Subtotal									260	0.3	146	9	9	53	3.9	0.004	2.2	0.1	0.1	0.8

FUGITIVE DUST EMISSIONS FROM PAVED AND UNPAVED ROADS IN CONSTRUCTION ZONE

Equipment Type	No. of Devices	Daily Mileage per Device (mi/day)	Daily Mileage per Device on Paved Roads (mi/day)	Daily Mileage per Device on Unpaved Roads (mi/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
						NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
All Terrain Forklift	1	1.6	0	1.6	30	-	-	-	0.58	0.09	-	-	-	-	0.009	0.001	-
18 Wheeler Truck	2	1.2	0.6	0.6	30	-	-	-	0.82	0.16	-	-	-	-	0.01	0.00	-
Subtotal						-	-	-	1.4	0.3	-	-	-	-	0.02	0.00	-

FUGITIVE DUST EMISSIONS FROM PAVED ROADS OUTSIDE CONSTRUCTION ZONE

Equipment Type	No. of Devices	Daily Mileage per Device (mi/day)	Daily Mileage per Device on Paved Roads (mi/day)	Daily Mileage per Device on Unpaved Roads (mi/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
						NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
18 Wheeler Truck	2	58.8	58.8	0	30	-	-	-	37.4	9.33	-	-	-	-	0.56	0.14	-
Subtotal						-	-	-	37.4	9.3	-	-	-	-	0.56	0.14	-

FUGITIVE DUST EMISSIONS FROM EARTHMOVING

Equipment Type	No. of Devices	Daily Operation per Device (hrs/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
				NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Track Backhoe	1	12	30	-	-	-	4.3	2.4	-	-	-	-	0.06	0.04	-
Subtotal				-	-	-	4.3	2.4	-	-	-	-	0.06	0.04	-

TOTAL EMISSIONS

									Daily Emissions (lb/day)						Total Emissions (tons)					
									NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
									260	0.27	146	53	21	53	3.9	0.0040	2.2	0.79	0.32	0.79

Table 8
Emissions from Onshore Pipeline Installation - Drilling
Cabrillo Port LNG Deepwater Port

EQUIPMENT EXHAUST EMISSIONS

Equipment Type	No. of Devices	Engine Rating per Device (bhp)	Fuel Type	Daily Operation per Device (hrs/day)	Daily Mileage per Device (mi/day)	Average Load	Total Working Days	Engine Output (bhp-hr/day)	Daily Emissions (lb/day)						Total Emissions (tons)					
									NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Large Drilling Rig (HDD)	2	500	diesel	24	-	80%	30	19,200	203	0.20	110	6	6	42	3.0	0.0031	1.7	0.10	0.10	0.63
Mud Cleaner Generator	1	400	diesel	24	-	80%	30	7,680	81	0.08	44	3	3	17	1.2	0.0012	0.7	0.04	0.04	0.25
Mud Pumps	2	500	diesel	24	-	80%	30	19,200	203	0.20	110	6	6	42	3.0	0.0031	1.7	0.10	0.10	0.63
Fluid Handling Pumps	4	75	diesel	24	-	80%	30	5,760	71	0.06	47	4	4	13	1.1	0.0009	0.7	0.06	0.06	0.19
Track Backhoe	1	200	diesel	12	-	50%	30	1,200	13	0.01	7	0	0	3	0.2	0.0002	0.1	0.01	0.01	0.04
All Terrain Forklift	1	100	diesel	12	-	50%	30	600	6	0.01	5	0	0	1	0.1	0.0001	0.1	0.00	0.00	0.02
Light Towers	6	20	diesel	12	-	100%	30	1,440	18	0.02	16	2	2	3	0.3	0.0002	0.2	0.03	0.03	0.05
Heavy Lift Crane	1	500	diesel	6	-	50%	30	1,500	16	0.02	9	0	0	3	0.2	0.0002	0.1	0.01	0.01	0.05
18 Wheeler Truck	2	-	diesel	-	60	-	30	-	4	0.01	0.21	0.03	0.03	0.06	0.1	0.0002	0.00	0.000	0.000	0.001
Subtotal									616	0.6	347	22	22	125	9.2	0.009	5.2	0.3	0.3	1.9

FUGITIVE DUST EMISSIONS FROM PAVED AND UNPAVED ROADS IN CONSTRUCTION ZONE

Equipment Type	No. of Devices	Daily Mileage per Device (mi/day)	Daily Mileage per Device on Paved Roads (mi/day)	Daily Mileage per Device on Unpaved Roads (mi/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
						NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
All Terrain Forklift	1	1.6	0	1.6	30	-	-	-	0.58	0.09	-	-	-	-	0.009	0.001	-
18 Wheeler Truck	2	1.2	0.6	0.6	30	-	-	-	0.82	0.16	-	-	-	-	0.01	0.00	-
Subtotal						-	-	-	1.4	0.3	-	-	-	-	0.02	0.00	-

FUGITIVE DUST EMISSIONS FROM PAVED ROADS OUTSIDE CONSTRUCTION ZONE

Equipment Type	No. of Devices	Daily Mileage per Device (mi/day)	Daily Mileage per Device on Paved Roads (mi/day)	Daily Mileage per Device on Unpaved Roads (mi/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
						NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
18 Wheeler Truck	2	58.8	58.8	0	30	-	-	-	37.4	9.3	-	-	-	-	0.56	0.14	-
Subtotal						-	-	-	37.4	9.3	-	-	-	-	0.56	0.14	-

FUGITIVE DUST EMISSIONS FROM EARTHMOVING

Equipment Type	No. of Devices	Daily Operation per Device (hrs/day)	Total Working Days	Daily Emissions (lb/day)						Total Emissions (tons)					
				NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Track Backhoe	1	12	30	-	-	-	4.3	2.4	-	-	-	-	0.06	0.04	-
Subtotal				-	-	-	4.3	2.4	-	-	-	-	0.06	0.04	-

TOTAL EMISSIONS

	Daily Emissions (lb/day)						Total Emissions (tons)					
	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
	616	0.62	347	65	34	125	9.2	0.009	5.2	1.0	0.5	1.9

Table 9
Emission Factors for Construction
Cabrillo Port LNG Deepwater Port

Source Type	Emission Factors						Units	Reference	Assumptions
	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC			
Diesel Off-Road Equipment (11 ≤ hp < 25)	5.6	0.0048	4.9	0.6	0.6	1.0	g/hp-hr	40 CFR 89.112, URBEMIS2002	See Table 10
Diesel Off-Road Equipment (25 ≤ hp < 50)	5.6	0.0048	4.1	0.45	0.45	1.0	g/hp-hr	41 CFR 89.112, URBEMIS2002	See Table 10
Diesel Off-Road Equipment (50 ≤ hp < 100)	5.6	0.0048	3.7	0.3	0.3	1.0	g/hp-hr	42 CFR 89.112, URBEMIS2002	See Table 10
Diesel Off-Road Equipment (100 ≤ hp < 175)	4.9	0.0048	3.7	0.22	0.22	1.0	g/hp-hr	43 CFR 89.112, URBEMIS2002	See Table 10
Diesel Off-Road Equipment (175 ≤ hp < 300)	4.9	0.0048	2.6	0.15	0.15	1.0	g/hp-hr	44 CFR 89.112, URBEMIS2002	See Table 10
Diesel Off-Road Equipment (300 ≤ hp)	4.8	0.0048	2.6	0.15	0.15	1.0	g/hp-hr	45 CFR 89.112, URBEMIS2002	See Table 10
Diesel Offshore Vessel Equipment	6.900	0.005	8.500	0.400	0.400	1.000	g/BHP-hr	URBEMIS2002, Appendix H	See Table 10
Gasoline Off-Road Equipment	3.015	0.131	114.315	0.131	0.131	4.326	g/BHP-hr	SCAQMD CEQA Air Quality Handbook, Table A9-3-A	See Table 10
Diesel Heavy Heavy Duty Truck	15.104	0.048	0.781	0.119	0.119	0.226	g/mi	EMFAC2002	See Table 10
Paved Roads (Shore Crossing Activities)	-	-	-	0.318	0.0794	-	lb/mi (lb/VMT)	AP-42, Section 13.2.1	See Table 11
Paved Roads (Onshore Pipeline Installation)	-	-	-	0.100	0.0248	-	lb/mi (lb/VMT)	AP-42, Section 13.2.1	See Table 11
Unpaved Roads (Shore Crossing Activities)	-	-	-	0.36	0.056	-	lb/mi (lb/VMT)	AP-42, Section 13.2.2	See Table 11
Unpaved Roads (Onshore Pipeline Installation)	-	-	-	0.31	0.048	-	lb/mi (lb/VMT)	AP-42, Section 13.2.2	See Table 11
Earth Moving (with Track and Non-wheeled Equipment)	-	-	-	0.36	0.20	-	lb/hr	AP-42, Section 11.9, Table 11.9-1	Bulldozing overburden; silt content = 8.5% (see Table 5); moisture content after wetting = 16.8% (AP-42 Table 11.9-3, upper bound for overburden).
Tertiary Crushing (Trenching Machine)	-	-	-	0.00054	0.00010	-	lb/ton	AP-42, Section 11.19, Table 11.19-2	Emission factors for source controlled with water suppression
Conveyor Transfer Points (Trenching Machine)	-	-	-	0.000046	0.000013	-	lb/ton	AP-42, Section 11.19, Table 11.19-2	Emission factors for source controlled with water suppression
Soil Screening (Fill Dirt Screener)	-	-	-	0.00074	0.000050	-	lb/ton	AP-42, Section 11.19, Table 11.19-2	Emission factors for source controlled with water suppression

Table 10
Assumptions for Emission Factors - Vessels and Equipment
Cabrillo Port LNG Deepwater Port

Source Type	Pollutant(s)	Reference	Assumptions
Diesel Off-Road Equipment	NO _x	40 CFR 89.112, Tier 2 Emission Standards	NO _x emission factor equal to Tier 2 emission standard for NO _x +NMHC
	SO ₂	URBEMIS2002, Appendix H	Year 2000; 37.1% efficiency; diesel sulfur content of 15 ppm
	CO	41 CFR 89.112, Tier 2 Emission Standards	
	PM ₁₀ , PM _{2.5}	42 CFR 89.112, Tier 2 Emission Standards	PM ₁₀ and PM _{2.5} emission factors equal to Tier 2 emission standard for PM
	ROC	40 CFR 89.112, Tier 1 Emission Standards	ROC emission factor equal to Tier 1 emission standard for NMHC (engines > 175 hp)
Diesel Offshore Vessel Equipment	All	URBEMIS2002, Appendix H	Year 2000; 37.1% efficiency; diesel sulfur content of 15 ppm; PM _{2.5} assumed equal to PM ₁₀
Gasoline Off-Road Equipment	All	SCAQMD CEQA Air Quality Handbook, Table A9-3-A	34.6% efficiency; PM _{2.5} assumed equal to PM ₁₀
Diesel Heavy Heavy Duty Truck	All	EMFAC2002	HHD Trucks; T7; Summer; VCAPCD; Year 2000 with 100,000 miles; I/M; 37.1% efficiency; diesel sulfur content of 15 ppm; PM _{2.5} assumed equal to PM ₁₀

Table 11
Assumptions for Emission Factors - Paved and Unpaved Roads
Cabrillo Port LNG Deepwater Port

Paved Roads

$$\text{Emission Factor} = [k (sL/2)^{0.65} (W/3)^{1.5} - C] [1 - (P/4N)]$$

AP-42, Section 13.2.1, Equation (2)

Particulate Size Multiplier	k (for PM ₁₀)	0.016 lb/VMT	AP-42, Section 13.2.1, Table 13.2.1-1
	k (for PM _{2.5})	0.004 lb/VMT	AP-42, Section 13.2.1, Table 13.2.1-1
Road Surface Silt Loading	sL	1.02 g/m ²	Based on silt loading of 0.03 oz/yd ² for collector streets (SCAQMD CEQA Air Quality Handbook Table A9-9-C-1)
Average Weight of Vehicles	W	see below	
Emission Factor for Exhaust, Brake Wear, and Tire Wear	C (for PM ₁₀)	0.00047 lb/VMT	AP-42, Section 13.2.1, Table 13.2.1-2
	C (for PM _{2.5})	0.00036 lb/VMT	AP-42, Section 13.2.1, Table 13.2.1-2
Number of "Wet Days" in Period	P	17 days	=34 days (180 days/365 days) { 34 days is the average number of annual "wet days" in the South Coast Air Basin [SCAQMD CEQA Air Quality Handbook Table A9-9-C-1] }
Number of Days in Period	N	180 days	Length of construction period

Unpaved Roads

$$\text{Emission Factor} = [k (s/12)^a (W/3)^b] * [1 - \text{Control}]$$

AP-42, Section 13.2.2, Equation (1a) modified to account for water control measures

Constants for Equation 1a	k (for PM ₁₀)	1.5 lb/VMT	AP-42, Section 13.2.2, Table 13.2.2-2
	k (for PM _{2.5})	0.23 lb/VMT	AP-42, Section 13.2.2, Table 13.2.2-2
	a	0.9	AP-42, Section 13.2.2, Table 13.2.2-2
	b	0.45	AP-42, Section 13.2.2, Table 13.2.2-2
Surface Material Silt Content	s	8.5 %	AP-42, Section 13.2.2, Table 13.2.2-1
Average Weight of Vehicles	W	see below	
Water Control Effectiveness	Control	85%	AP-42, Section 13.2.2, Figure 13.2.2-2

Average Weight of Vehicles (W) During Shore Crossing Activities

Equipment	Loaded Weight (tons)	Vehicle Weight (tons)	Mean Weight (tons)	
All Terrain Forklift	5.5	3.5	4.5	
18 Wheeler Truck	40	20	30.0	
Average for Vehicles on Paved Roads ¹			30.00	W for Paved Roads
Average on Unpaved Roads ²			17.25	W for Unpaved Roads

Notes:

1. Only 18-Wheeler Truck.
2. All vehicles

Average Weight of Vehicles (W) During Onshore Pipeline Installation

Equipment	Loaded Weight (tons)	Vehicle Weight (tons)	Mean Weight (tons)	
Front End Loader	6.5	4.5	5.5	
Dump Truck	16	6	11.0	
Water Truck	10	6	8.0	
Utility Truck	2.5	2.5	2.5	
Heavy Fork Lift	5.5	3.5	4.5	
Low Boy Truck	10.5	6	8.3	
Pipe Stringing Truck	16	6	11.0	
Mobile Crane	25	25	25.0	
Cement Truck	40	19	29.5	
Asphalt Truck	16	6	11.0	
All Terrain Forklift	5.5	3.5	4.5	
18 Wheeler Truck	40	20	30.0	
Average for Vehicles on Paved Roads ¹			13.91	W for Paved Roads
Average on Unpaved Roads ²			12.56	W for Unpaved Roads

Notes:

1. All vehicles except front end loader, heavy fork lift, mobile crane, and all-terrain forklift
2. All vehicles

Table 12
Emissions from Worker Commuting
Cabrillo Port LNG Deepwater Port

Parameter	Units	Value	Comments				
Average One-Way Trip Length	miles/trip	16.2	Average Trip Length (Reference 1, Section 2.3)				
Average Roundtrip Distance	miles/roundtrip	32.4	= Average Trip Length x 2				
Vehicle Operation	Units	Emission Factor ^{a,b,c,d}					
		NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Running Exhaust & Evaporative	g/mile	0.29	0.05	2.75	0.005	0.005	0.06
Tire Wear	g/mile				0.10	0.10	
Cold Start	g/trip	1.21		47.65			1.30
Hot Start	g/trip	0.58		3.76			0.23
Diurnal	g/vehicle-day						0.54

References:

1. Southern California Association of Governments. July 2000. 1999 State of the Commute Report
2. South Coast Air Quality Management District. April 1993. CEQA Air Quality Handbook

Notes:

- a. Emission factors, except SO₂, from Reference 2, Table A9-5-J-10.
- b. NO_x and CO emission factors reported for AREA2; running exhaust & evaporative emission factors based on 20 mph. Speed used in emission factor selection based on AM Peak Speed for Los Angeles County (21 mph) from Reference 2, Table A9-5-F.
- c. ROC emission factors reported for AREA2; running exhaust & evaporative emission factors based on 35 mph. Speed used in emission factor selection based on Off Peak Speed for Los Angeles County (33 mph) from Reference 2, Table A9-5-F.
- d. SO₂ emission factor from Reference 2, Table A9-5-L for AREA2 in 2009.

Onshore Pipeline Construction (Ventura and Los Angeles Counties)

Number of Worker Roundtrips	roundtrips/day	120					
Daily Mileage for All Vehicles	miles/day	3888	Average Roundtrip Distance x Number of Worker Roundtrips				
Days with Roundtrips	days	240					
Vehicle Operation	Emission Units	Emissions					
		NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Exhaust & Evaporative, and Tire Wear	Daily (lb/day)	2.5	0.43	23.6	0.900	0.900	0.5
Cold Start, Hot Start, and Diurnal	Daily (lb/day)	0.95		27.2			1.10
All	Daily (lb/day)	3.4	0.43	50.8	0.90	0.90	1.6
All	Total (tons)	0.41	0.05	6.1	0.11	0.11	0.19

Shore Crossing Construction (Ventura County)

Number of Worker Roundtrips	roundtrips/day	60					
Daily Mileage for All Vehicles	miles/day	1944	Average Roundtrip Distance x Number of Worker Roundtrips				
Days with Roundtrips	days	108					
Vehicle Operation	Emission Units	Emissions					
		NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Exhaust & Evaporative, and Tire Wear	Daily (lb/day)	1.2	0.21	11.8	0.450	0.450	0.3
Cold Start, Hot Start, and Diurnal	Daily (lb/day)	0.47		13.6			0.55
All	Daily (lb/day)	1.7	0.21	25.4	0.45	0.45	0.8
All	Total (tons)	0.09	0.012	1.4	0.02	0.02	0.04

Offshore Pipeline Construction and FSRU/Mooring Installation (Ventura County)

Number of Worker Roundtrips	roundtrips/day	200					
Daily Mileage for All Vehicles	miles/day	6480	Average Roundtrip Distance x Number of Worker Roundtrips				
Days with Roundtrips	days	11	Workers stay onboard during duration of offshore construction				
Vehicle Operation	Emission Units	Emissions					
		NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
	Daily (lb/day)	4.1	0.71	39.3	1.500	1.500	0.9
	Daily (lb/day)	1.58		45.3			1.83
	All Daily (lb/day)	5.7	0.71	84.6	1.50	1.50	2.7
	All Total (tons)	0.0315	0.0039	0.47	0.008	0.008	0.015

TOTAL PER COUNTY

	Emission Units	Emissions					
		NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
Ventura County	Daily (lb/day)	10.9	1.36	161	2.9	2.9	5.1
Los Angeles County	Daily (lb/day)	3.4	0.43	51	0.90	0.90	1.6
TOTAL	Daily (lb/day)	14	1.8	212	3.8	3.8	6.7
Ventura County	Total (tons)	0.54	0.07	7.9	0.14	0.14	0.25
Los Angeles County	Total (tons)	0.41	0.05	6.1	0.11	0.11	0.19
TOTAL	Total (tons)	0.95	0.12	14.0	0.25	0.25	0.4

